THE COMPACT STRUCTURE OF A NEW BIOSENSOR MONITOR

BACKGROUND OF THE INVENTION

(a) Field of the invention

This invention discloses the compact structure of a new biosensor monitor. This new portable structure comprises of a two-in-one design of a biosensor monitor for the simultaneous measurement of blood glucose, uric acid and cholesterol as well as a blood collection device with a needle.

(b) Description of the Prior Art

All the conventionally available biosensor monitors generally comprises of a monitor and a blood lancer which collects a tiny drop of blood by means of piercing a sharp needle into the finger or arm. Although they are designed to be portable, however, it requires more box space to put in both the monitor and blood lancer, making it rather bulky and inconvenient to carry around. Furthermore, the operation of conventional blood lancer requires two hands, one hand for triggering and another one for needle puncture onto the right spot of the skin. Such conventional design of the monitor and the blood lancer includes two separate individual items, resulting in higher costs and less portability.

Moreover, the blood collection process by such blood lancer with both hands is rather in inconvenient. Therefore, a new monitor with two in one design to include a blood lancer to reduce costs, and hence enhanced portability, will be a great niche for sales promotion in the market where competition is very keen.

SUMMARY OF THE INVENTION

It is therefore the objective of this new design to provide a mechanism with the monitor and blood lancer in one piece, small in size and one finger operation only, which will be free from the inconvenience and disadvantages associated with the conventional biosensor device.

The mechanical structure of this two-in-one device comprises of a housing within which there is a circuit board with a receiver slot for the test strip to be inserted in. Signals received from the reaction of the reagent on the test strip with the applied blood will be analyzed via the built-in CPU (Central Processing Unit) and shown on the LCD (Liquid Crystal Display) screen and, or, be transmitted through the communication port (USB, Serial or Parallel Port) to the internet server by mobile phone for further data acquisition and analysis. This two-in-one structure also houses a blood lancer, which composes of a number of parts and springs, to pierce the sharp needle into the skin for

a tiny drop of blood. This lancer fits a disposable needle, for single use only, and replacing the used needle with a new one automatically reloads the needle ready to be triggered for blood inoculation, upon the touch one finger only. With this unique two-in-one of structural design, blood specimen can be easily collected with the touch of, say, a finger onto the lancer to trigger the release of the needle, and be applied onto the reagent of the test strip to determine its results of electrochemical reaction through the measurement of electrical current or voltage which will then be processed via the built-in CPU to display on the LCD screen, and, or, be transmitted via wireless communication to a server, or to a linked computer for further data storage and analysis.

BRIEF DESCRIPTION OF THE DRAWINGS

The two-in-one structure of the present invention may be more readily understood by one skilled in the art with reference to the following detailed drawings, wherein like elements are designated by identical reference numbers throughout the several views, and in which:

Fig. 1 is a schematic view of the two-in-one biosensor monitor pursuant to the teachings of the present invention, illustrating the test strip to be inserted into the monitor and a prompt icon displayed on the monitor LCD screen upon inserted of the test strip.

Fig. 2 illustrates the top view of the positional relationship of the several components of the biosensor monitor.

Fig. 3 illustrates the side view of the positional relationship of the several components of the biosensor monitors.

Fig. 4 is the cross-sectional view of the several components of the lancer when the needle is in the free, unloaded state.

Fig. 5 is the cross-sectional view of the several components of the lancer when the needle is loaded and ready to trigger for the release of the needle.

Fig. 6 is the cross-sectional view of the several components of the lancer when the lancer is triggered and the needle is released to its most forward position.

Fig. 7 illustrates the exploded view of the several components of the lancer.

Fig. 8 illustrates the relative angular position of the several components of the lancer.

Fig. 9 is the top view of the positional relationship of the several components of the monitor with the protective cap and needle cover of the needle.

Fig. 10 is the top sectional view of the relative position of the

protective cap and the needle cover, demonstrating the mechanism for the adjustment of the protective cap for several different depth of the needle inoculated into the skin for different amount of blood drop.

Fig. 11 is the side view of the protective cap, showing the guide to fix the needle cover in different position for different needle depth of penetration into the skin.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to the drawings in detail, Fig. 1, the schematic view of the two-in-one biosensor monitor pursuant to teachings of the present invention, shows a test strip 20 into the opening 12 on the upper protective cover 11 under which a printed circuit board 14 is placed to measure the electrochemical response of the test strip with the added drop of blood, and on which a LCD screen 15 displays the results of the processed signals from the circuit board 14, and on which a communication port (USB, serial or parallel) 13 transmits the processed signals via mobile phone to the internet server. Connected to this upper protective cover 11 is a protective cap 16 for the needle, not shown, on which there sits a needle cover 17. To have more insight into the mechanism of the monitor, Fig. 2 illustrates the positional relationship of the several components of the monitor. A couple of components

constitute a lancer 30 situated inside the upper protective cover 11. A needle 40 sits on the holder on the lancer 30. This Fig.2 gives a better view of the needle cover 17 and a protective cover 16 and the lancer 30, while Fig.3 gives the side cross sectional view of the monitor 10, the lancer 30 and the protective cover 16 with the needle cover 17.

Fig. 4, 5, and 6 illustrate the cross-sectional view of the lancer 30 with the needle in three different operational modes. Fig. 4 shows the positional relationship of the several components of the lancer in the free relaxed state, wherein the spring 32 has neither compressive nor tensional stress. Whereas, Figs 5 gives the positional relationship of the several components of the lancer 30 when the spring 32 is fully compressed to its limit as a new needle 40 is installed on, ready to release the needle 40. As soon as the needle cover 17 is pressed by the slightly touch of a finger tip, the outer tube 36, neighboring to and engaging with the needle cover 17, will be pushed to the left to trigger the rotation of the connecting rod 34 which in turn trigger the release of the needle 40 and its connecting components such as the needle receiver 35, the connecting rod 34 and the adaptor 33, by the compressive force of the spring 32. The inner tube 31 is stationary and sits onto the lower protective cover 18 by the two posts 39 which fits into

the opening space next to the left rear end of the inner tube 31, while the outer tube 36 slides along the inner tube 31, guided by the protrusion 363, on the inner rim of the outer tube 36 which fits well into the opening slot 312 of the inner tube 31. The outer tube 36 can slide to the left by the push of the neighboring needle cover 17 to the right and will slide to the right position by the compressive force in the spring 38. The sliding movement of the outer tube 36 only happens when the needle 40 is about to be trigger for release. The inner tube 31 holds well one end of the spring 32, while the adaptor 33 holds well the other end of the spring 32, and hence the adaptor 33 in non-rotatable. Although the adaptor 33 fits with the connecting rod 34, nevertheless the tolerance between them allows the connecting rod 34 to rotate freely against the adaptor 33. This connecting rod 34 fits tightly with the needle receiver 35 and as their combination moves to the left, it simultaneously will somewhat rotate because the triangular protrusion 344 of the connection rod 34 will be guided to rotate by the teeth 313 of the inner tube 31, which can better be understood by referring to Fig. 7 and Fig.8. The teeth 313 of the inner tube 31 will guide and force the triangular protrusion 344 of the connecting rod 34 to rotate relative to the inner tube 31, as the connecting rod 34 moves toward the inner tube 31, the teeth 362,

which lie inside the inner wall of the outer tube 36, will further guide and force the triangular protrusion to rotate and stay either at the stop 364 or the extreme position 365, depending upon the relative position of the triangular protrusion 344 with the teeth 313. When the triangular protrusion stays at the location 364, the needle 40 and the connecting rod 34 combination are in the position ready for the rode 40 to launch the inoculation for blood, just like the rode in Fig.5. Moreover, when the triangular protrusion 344 stays at the location 365, the connecting rod 34 and the needle 40 combinations are at the state of being after launch, just like the mode in Fig. 6. Fig.9, 10 and 11 illustrates the mechanism of the needle cover 17 and the protective cover 16, with which the needle cover 17 can rotate relative to the protective cover 16 to adjust the depth of the needle 40 piercing into the skin by the engaging slope 364 of the tube 36 with the slope 173 of the needle cover 17, which has a hole 171 for the needle 40 to go through and a number of grooves 172 for the protrusion 161 on the inner wall of the protective cover 16, as shown in Fig. 10 and 11, to define the depth of needle 40 into the skin, which then results in different amount of blood inoculation.